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[We are under obligations to an esteemed friend and correspondent, for a description of the interesting process of gold-washing of which he has had the opportunity of examining during a residence in the Gold Region.]

For the Railroad Journal and Mechanics' Magazine.

The Gold Region in the State of Georgia.

THE Gold Region in the State of Georgia, embracing a tract of country about ten miles wide, running north-east and south-west, lying just within the base of the Alleghany Mountains, (or, taking the local name, the Blue Ridge) in the centre of which, and traceable throughout its whole extent, is what is called the "Great Slate Vein." This great slate vein consists of slate rock, through which are numerous veins of auriferous quartz. The gold mines lying in, or immediately adjacent to, this vein, are the richest, and no mines of any moment have yet been discovered more than five miles north-west or south-east of it.

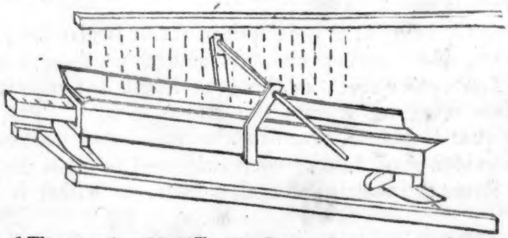
I am informed that the characteristics of the deposit mines are the same throughout Georgia, North Carolina and Virginia, but having been engaged solely in Georgia, I can speak positively only of the Georgian Mines. In these (deposit) mines, the gold is formed in detached particles or masses, and is entirely separated from everything else, by means of water. It is seldom more than 12 or 15 feet below the surface of the earth, and is found more or less in all parts of every valley or meadow in the gold region. It prevails, however, just below and opposite the point of a ridge terminating in the valley or meadow, apparently justifying the supposition that at some remote period of time the hills had been ruptured, and the gold contained in their bowels washed down the stream, and deposited in eddies formed by the projecting fragments of the hills. The situation of the gold would justify this opinion—and the appearance of the gold itself would declare its having been subjected to the action of an intense heat. The fanciful may combine these two phenomena, and they will find ample field for theorizing, as to the formation of the gold, and its lodging where it is found.

On removing the alluvial to the depth of six or twelve feet, a stratum of gravel is discovered of varying thickness, sometimes three, sometimes ten, but generaly four or five feet; *in* this gravel, and between it and a stratum of soft slate, on which it rests, the gold is formed. The gravel consists of white quartz pebbles, beautifully rounded and uniformly smooth, giving ample evidence of having been subjected to great friction—a yellowish earth forms the matrix of each pebble, in which it is so firmly

wedged as to require loosening with the pickaxe. The slate beneath, which occurs of all colors, and is seldom more than twelve inches thick, may be rubbed to pieces with the fingers; the gold sometimes exceeds two or three inches in the slate.

The machinery used for separating the field and earth are very simple, such as can be put together by ordinary workmen They are principally the "Long Tom," and the "Rocker." The Long Tom (the simpler machine, and used exclusively for working on a small scale) consists merely of a trough made of three planks nailed together, planed at a slight inclination, the lower end rests in the end of another horizontal trough made to receive it, the bottom of which is a cast-iron plate pierced with holes. Immediately below the plate, another trough is placed at a greater inclination than either of the others, generally slanting in an opposite direction; across the bottom of this lowest trough, bars are placed dividing the "riffler," as it is called, into different apartments. A small run of water is let into the trough at A, by means of which the earth is washed. The Tom is generally placed directly along side of the pit to be worked, the gravel thrown into the machine between A and B, and, if of a clayey nature, as is sometimes the case, is rubbed backwards, until the stones are clean; the dirt from the stones is conveyed by the water down upon the plate through the holes, and is caught by the riffler underneath. The specific gravity of the gold causes it to descend to the bottom of the apartment, while the dirt being lighter, is beaten up by the water, and passes from one division to another, depositing in one chamber what gold may have been carried over from the preceding. The larger stones are slid over the plate and thrown away from C. The horizontal trough B C, is about four feet long; D should project beyond B, that all the sand may be caught; B H may be one trough, or a succession of any number. This machine is very simple, and may be easily attended to. Five hands form a full complement, but three can attend to it well. The principal objection is, that it does not wash enough earth in a day.

The "Rocker" is a somewhat different machine, consisting of a "Riffler," as in the Tom, except that the bars are concave on their upper edges, so enclosed in a frame that it may be drawn out (as a drawer) or wedged in, so as to move only with the machine. This frame is supported on rockers like those of a child's cradle, which play backwards and forwards, on four pieces of timber, placed in a parallelogram form, fixed, temporarily, on the ground so as to give the whole machine a slanting position—but to keep the machine from slipping off, each rocker plays over a pin projecting upwards from the head and tail piece of the parallelogram. Extending over the riffler, and parallel with it, are (generally three) plates of cast-iron, the head-piece solid, the rest pierced with holes like that of the Tom. On each side of the plate, to keep the earth that is washed in the machine, are placed pieces of plank. The whole machine is worked by means of a handle or lever fixed to the body of the machine. I have here represented the riffler partly drawn out.



* The engraving of the "Tom" will appear in our next number.

Water is conveyed by means of troughs directly over the machine, where it is equally distributed over the middle and upper portions of the plates. When there are four plates, the whole machine is about 10 feet long. Being brought as near the place of work as possible, the gravel is conveyed by means of wheelbarrows from the pit to a small platform at the head of the rocker, where it is "dumped." A hand, standing ready with a shovel, feeds the machine gradually, throwing one shovel full at a time on the solid plate at the head of the machine, which is hardly waist high. A man at the handle gives the machine a gentle motion—he is sometimes aided by springs, against which the ends of the rockers act—and by the jar causes the gravel to descend gradually over the plates, where it is thoroughly cleansed from the dirt; it falls from the tail of the piece upon a small platform, where a hand stands and removes it with a shovel—the earth and small stones fall through the plates with the water on the riffler. Here, the jarring aided by the specific gravity, causes the gold to settle more perfectly in the chambers, and the earth and light stones to rise and float off better than in the Tom. They are discharged through the spout represented in the cut, between the rockers under the body; a drain leads the water around the tail of the machine, and requires the constant attendance of a hand to clear away the sand that passes through. Hence, four hands at a rocker will give ample employment to two wheelbarrows, and require two other hands in the pit. Thus eight hands are required to work a rocker; but a "gang" usually consists of eleven, the remaining three being employed in "topping," that is, removing the alluvial that covers the gravel. In many mines slaves are employed, but I think the greater part of the labor is performed by whites. At night, when the day's labor is done, the riffler is drawn out, and the chambers are found nearly filled with heavier portions of the sand, they are carefully emptied into an iron pan—the gold to inexperienced eyes still invisible—and taken to a pool of still water, and gently agitated a little below the surface, which causes the gold to settle and some of the earth to glide off in the water; this operation is continued until all the sand is removed, and nothing but the gold left. It is called "panning out," and a careful hand will never lose even the smallest particle.

In deposit mines the gold varies in size considerably; it is sometimes coarse, sometimes fine, and not unfrequently both coarse and fine are found together It is uniformly of a bright color, and when coarse, its surface indicates having been in a state of fusion; when fine, it is sometimes ragged and sharp, at others smooth. By "fine gold," is understood, particles varying in size from such as can hardly be seen, to those weighing three pennyweights; when larger, it is "coarse gold." I know of one mine, and only one, where it is frequently found in the form of flakes connected with quartz rock. But here it was evidently thrown out from a vein without having been melted.

Deposit mines yield variously—sometimes just enough to say there is gold there, and in a few instances, mines have produced 1175, 1400 and 2800 pennyweights in a single day, but these are extraordinary. A person is able to pay his expenses, the wear and tear of his tools, and the price of his hands, 62½ cents a day each, *not* found—when he makes as much as one pennyweight a day for every hand he has employed. A pennyweight is worth on an average 97 cents. A tom costs from one to three dollars—a rocker about thirty. The long-handled pointed shovel is used universally. Old machines are invariably burnt up, and the ashes "panned out," for the fine gold that has lodged in the joints of the wood, and sometimes yield half the first cost.

Having turned my attention almost solely to deposit mines, my knowledge of veins is not of a character to warrant any communication to you about them—when, however, a mine is in full operation, the owner may make accurate calculations as to what his income may be for six months ahead of him. But of the deposit mines, one may exclaim in the language of the mines—they are "mighty uncertain." Respectfully, ———

Internal Improvements of Illinois.

To the Editors of the Railroad Journal and Mechanics' Magazine—

Messrs. Editors—In entering into a description of the internal improvements that this State has undertaken, and occupying as it does so broad a *base*, justice to the subject can hardly be done, when brevity and a correct delineation are the governing considerations in the composition of the communication. An approximation, therefore, in embracing the whole system, is all that I shall presume to reach at this period.

Illinois, in a topographical point of view, may very truly be said to be favorable to the economical construction of works of a public character, and this fact, in connection with the rapid settlement of the State, was, no doubt, the influencing consideration in the framing of the system by the Legislature, who in 1837 embarked in the project. Soon after which, an organization of engineering districts was made, at the head of which, agreeably to the internal improvement law, was placed a Commissioner of Public Works and an Engineer-in-chief; and since this organization, all the preliminary surveys for the various routes authorized to be surveyed, located, and placed under contract, have been finished, or nearly so, and her works are now in a rapid progress towards active completion, having nearly 300 miles now under contract, with a contemplated addition of nearly the same number of miles for contract the coming season—distributed proportionally over the various sections of the State.

To attempt a classification of the different works in the order of their importance, we would, by reference to the map of this State refer to the Illinois and Michigan Canal, as one pre-eminent over any other within the jurisdiction of the State, connecting as it does, Chicago with Peru on the Illinois river, whereby an entire water communication between the former place and St. Louis will be effected, when this new channel is completed. After this, comes the great Central Railroad, extending from Galena on the Mississippi, to Cairo at the junction of the Ohio and Mississippi rivers, crossing the Illinois river at the termination of the canal, and thence to Vandalia and Cairo, *via* several towns of importance, bordering on a general line. After this, the Northern and Southern cross Railroads; also, the Alton and Shelbyville, with its continuation to Terre Haute in Indiana, and many others as lateral branches from Peoria, easterly and southerly to Warsaw on the Mississippi river. After the completion of these works, and their auxiliaries, this State will have every means of transportation to the most remote points, affording every facility for the influx of emigration from all sources, and tending to her advancement in the arts and manufactures of the East. And, although encountering a heavy debt in the desire to promote the public good of her citizens by the construction of these works, no one will be disposed to question their usefulness as the State advances in population, and her ability to meet these demands accruing at some future period.

The aggregate expense of this system will, in all probability, exceed, by $5,000,000, the amount estimated by the Legislature, when the ypassed the internal improvement bill.

Without wishing to occupy too much space in your pages, at this time, I shall reserve for a future communication a minute detail of the mode of construction and capacity of these Roads.

EDWARD S——.

New-York and Erie Railroad.

To the Editors of the Railroad Journal and Mechanics' Magazine—

GENTLEMEN,—Through the kind attention of a friend, I came into possession, a few days since, of "the Report of the Committee on Railroads; on the memorial of the President, Directors and Company of the New-York and Erie Railroad Company, and the Memorials of Petitions of citizens of sundry counties," (Assembly Report, No. 67, January 19, 1839)—I take the liberty very briefly to notice what will appear to be a very great error; see Appendix, addressed to the Hon. John B. Scoles, by Samuel P. Lyman, Esq., Commissioner of the New-York and Erie Railroad Company, it is stated—"that the Report of Mr. Johnson, which is an Appendix to the Report of Mr. Holley, of the Committee on Railroads, at the last session, so clearly demonstrates the practicability of the project, *and the superiority of this line, over all other communications, extending, or to be extended, from New-York to the Western Lakes, or to the Valley of the Ohio, and its vast importance to the commercial, agricultural and manufacturing interests.*" Now, that these sentiments are entirely erroneous, and this line is *very inferior*, will be readily conceded by the impartial enquirer, when compared with a line of railroads, either made, located or projected, across the State of New-Jersey, *via* Morristown, the Delaware Water Gap, into Pennsylvania, passing through an important timber district, into and over twenty miles length of the purest anthracite coal, and up the valley of the Susquehanna, along the bituminous coal fields of Bradford County, to the New-York State line north of Athens, and within a few hundred yards of the New-York and Erie Railroad, as now located.

It will, on examination, be found *vastly inferior*—because the line to Western New-York through New-Jersey and Pennsylvania is more direct, and about seventy-four miles nearer in going towards the Western Lakes *via* Elmira; because on this line there are several great coal, iron, and timber districts; because no grades exceeding 45 feet to the mile need be adopted, and stationary power is not required; because it would add a population of 150,000 people to the business community of the city of New-York, and would certainly supply the city and the Western and Southern counties of the State of New-York with coal and other supplies at the cheapest rate, to any desired extent; because it would lessen the expenditure of at least one million of dollars, and the freight and toll one-sixth on the whole business.

The charters and laws are all obtained, and the citizens of New-York will find, on enquiry, that there are no hindrances to the immediate construction of this line of Railroad to intersect the New-York and Erie Railroad, provided that the means are furnished to carry it out, by your city, and those means required will be comparatively small.

A SUBSCRIBER.

Monroe County, Pa. February 9, 1839.

Report upon the Finances and Internal Improvements of the State of New-York.

(Continued from page 92.)

At the present rates of toll, say at four per cent.,this trade would yield an annual revenue to our treasury of $5,600,000; and if reduced to two per cent., it would yield $2,800,000; and even at one per cent., (equal to 2 cents only on a bushel of wheat) it would yield $1,400,000.

The evidence furnished by these facts has therefore satisfied the committee, that the estimate of the Canal Commissioners,that the tolls of the Erie canal when enlarged will, at the present rates, pay annually three millions of dollars, and that one-half of that sum will be received from property passing to and from other States, is, to say the least, not exaggerated.

It will be observed, that many of the views which are above taken of the future magnitude of our inland commerce, will be applicable to the two lines of rail-road which are to traverse our territory from the Hudson to Lake Erie. The immense effects which these wonder-working instruments of commerce are to produce in securing the trade of the West to the Atlantic States, and in binding the most distant portions of our country in bonds of beneficial intercourse, would furnish, upon the proper occasion, a subject of interesting and profitable inquiry. Nor need it be apprehended that they will affect injuriously our fiscal interests,—for so far from lessening the commerce of the canals, they will more probably serve to secure and increase it, by affording the means of rapid transportation for property and persons, during those winter months in which their navigation is impeded, and thereby preventing the diversion into other channels of those more bulky products which furnish to canals their most lucrative revenues.

Regarding the event as not improbable, that the State at no distant period will take these great thoroughfares of trade and travel as public property, and that they are eventually to become a portion of our system of public works, of which all the parts will mutually sustain and strengthen each other,—the growth of the West in swelling their revenues is by no means a matter of indifference to the public treasury.

The committee will not trespass upon the attention of the House, by expatiating upon the grandeur of the prospect which would open upon us, were we to look beyond the brief period which the present view has embraced. It is for the philanthropist and statesman, to indulge those feelings of honest hope and patriotic pride, which cannot but arise, in contemplating the mighty realities which the future has in store. The duty which the present occasion has required of the committee, has been of a more practical character. They have attempted honestly, perhaps over zealously, to show that our own noble State is neither ruined nor bankrupt,—that its treasury is neither impoverished nor exhausted,—and that, however impeded in its progress by a narrow policy which would retard its growth, undervalue its strength, and stifle its energies, it is yet vigorous and erect, and able to move onward with a giant's power. They have sought to show that the foundations of our prosperity are deeply laid; that our resources are manifold, and that they will prove adequate to any efforts which government may make, to promote the prosperity; reward the industry, or stimulate the enterprize of our citizens, whether occupying the fair and fruitful plains of the west,—the forests and mines of the north,—or the sunny slopes and fertile vallies of our southern and midland districts.

They will not attempt to measure the consequences which the completion of a great and harmonious system of intercommunication, extending into the utmost recesses of the interior, and concentrating within our borders the trade of the most populous portion of the continent, will produce, in augmenting the aggregate riches of our State;—in covering its surface with opulent cities;—in swelling its commercial marine;—in securing its political supremacy;—and enlarging, in all respects, its prosperity, power, and glory. Nor will they seek to compute the pecuniary results which this vast and ever increasing stream of inland trade, flowing through our territory for all future time, will produce in augmenting the wealth of its commercial metropolis. The history of Venice, in its palmiest days, stretching her long line of islands and colonies far into the East, and controlling by her position the commerce of Asia, presents but a feeble picture of the splendour and riches which our own great mart must eventually attain

Still less will they seek to span within their narrow arithmetic, the pecuniary value of the illimitable West. Were they to state that from an assessed value in 1798, of only 26 millions, for all the vast territory west of the mountains, stretching from the Gulf of Mexico to Lake Superior, wealth has arisen and been created within the short space of forty years to the amount of twelve hundred millions of dollars, they would have attained only the first step in that long series, by which an empire is to ascend to a height of power and dominion as yet unequalled in the history of our race.

Least of all will they attempt to compute the pecuniary consequences of these great arteries of trade, in cementing and preserving the union of these free and flourishing republics. It is not for New-York, or her sons, to "calculate the value" of that sacred bond. But if we would catch a glimpse, however imperfect, of the gigantic stake which is depending on our prudence and patriotism—if we would count the cost of ruined cities, and desolated fields,—of our lakes and rivers, obstructed by fleets and fortresses in war, and by commercial restrictions still more destructive in peace, we may contrast Europe as it is, couvulsed by centuries of strife, and broken into jarring, disunited, and discordant communities, with Europe, as it would have been, had its whole population been united like ours, at the very origin of their governments, under one common law, speaking one common language, and bound by one common constitution.

Let us then go forward in the broad path of duty which is spread before us--and in riveting, as now we may, the bonds which unite the mighty members of this glorious Union, discharge those high and solemn obligations which we owe not only to ourselves and those who surround us, but to the long line of generations who are to follow in after ages.

The committee, in order to carry out the views of this report, will prepare a bill, making the necessary appropriations, as soon as their object and amouut shall be determined by the proper committees, and sanctioned by the House. In the mean time, they beg leave to submit the following resolution:

Resolved, That it is not necessary or expedient to levy a direct tax.

Samuel B. Ruggles,
Victory Birdseye,
Thomas B. Cooke,
Abner Lewis,
} *Committee of Ways and Means.*

March 12, 1338.

Report from J. J. Abert, in reference to a Canal to connect the Chesapeake and Ohio Canal with the City of Baltimore.

(Continued from page 77.)

54. *Leakage at locks.*—It is highly important that losses from this cause should be considered in every estimate of water for a canal. Unlike filtrations, these are least at first, and increase as the canal is used. The water passes under the miter sills, between the gate-posts and the hollow coins, between the gates where they meet, from the valves, and under the bottom of the gates. All these are closer when new, and, from gradual wear and other causes, open more and more every day, until repairs, and ultimately, new gates become necessary. It is also worthy of remark, that in a series of locks, all depending upon the same source for supplies of water, it is the lock of greatest leakage which must be considered. If the second lock of a series, for instance, leaks more than the first, then the leakage from the first will not keep up the intermediate level, as more than it supplies is drawn off by the second lock. So, also, if the lock of the greatest leakage be the third or fourth. And when many locks are dependent upon the same source, it would be absurd to suppose that each was constructed, and its gates fitted with the same care. So that a slight accident to any one of a series, not sufficient to justify the stopping of the navigation for repairs, increases the leakage, which the summit has to supply. On these accounts, there can be no average of the leakage from many locks as the basis of an estimate, or as proof of what a canal loses from this cause. It must lose that which leaks from the lock of greatest leakage, and cannot lose less.

Losses from this cause, in long levels, are not so serious nor so sensible to observation as in short ones. In these last they are both soon observed and felt.

55. Andreossi (p. 223) reports the result of observations on this account, of loss experienced on the Languedoc canal, by the engineer, Mr. Pinn. These observations were made upon many locks, and the mean of the whole is stated to be 10 litres, or 610·28 cubic inches per second. The objection to this result is, that it is a mean of the whole, instead of being the loss from the lock of greatest leakage, which, as we have already shown, is the actual loss sustained.

26. Ten litres per second is equal to 30,514 cubic feet per day; or, for the two locks, one at each end of the summit, 61,028 cubic feet, (our measure); which, in a month of 30 days, would amount to 1,830,840 cubic feet, or to 67,808·88 cubic yards, (say 67,809); which for the ten months of navigation, would be 678,090 cubic yards.

57. The size of the locks of the Languedoc canal is very great, and their curved sides give an unusual cubic content. Owing to this form of construction, (bad in itself, and long since abandoned) we cannot well make a comparison of its prisms of lift with the leakage of its locks.

58. There is another reflection proper to be made. All other things being equal, the leakage must be in proportion to the perpendicular height of the water, or to the pressure to which the orifices or openings are exposed; and also the leakage surface (that is, the joints) must be in proportion to the lift of the lock and the width of the gates.

59. These circumstances render the applications of observations on canals of extremely doubtful propriety, where we are not fully possessed of a knowledge of all influencing dimensions and causes. Upon the

same canal, the width of the lock-gates must be the same, but the lift of the locks need not be, and often does vary considerably. Now, in the very canal we have named, the second lock from the summit in one direction has a lift of more than 9 feet, while that of the first is about 7½ feet; the ninth lock also has a lift of between 11 and 12 feet. It is clear, therefore, that the average from the leakage of such variable lifts must give a false result (and false to a great amount) of the absolute quantity really drawn from the summit to supply the leakage of the locks, which, as we have before remarked, can never be less than that of the lock of greatest leakage. At the opposite end of the summit, among the locks depending upon the summit for its water, there is one of more than 12 feet lift. The summit is therefore really subjected to the leakage from these two locks of so great a lift. We will take the two extremes, of 7½ and 12 feet, to illustrate our reasoning by an example.

60. The discharge under the two pressures, 7½ and 12 feet, being to each other as the square roots of the pressures, are about as 27 is to 35, or the discharge from the latter is about one-third more than from the former; which would make a loss of 904,120 cubic yards for the ten months, by taking the lock of the grestest leakage.

61. Although we cannot make a just comparison of this loss with the prism of lift of the locks of this canal, on account of the reasons heretofore stated, we will see, however, what it would be if the sides of the lock-chamber were a right line, and the chamber an oblong square instead of an oval.

62. Taking the dimensions of the first lock from the summit, and reducing its cube by straightening its sides, we shall find its lock-full, or prism of lift, to be about 346 cubic yards. The corrected prism of lift being then 346 cubic yards, (Gauthey, p. 48,) and the leakage at the lock-gates being 1,130 cubic yards per day, it amounts to nearly 3¼ locks-full (prism of lift) per day for one lock. But the increase of this leakage, on account of the lock of greatest leakage, will bring the amount to 1,507 cubic yards per day; or rather more than 4⅓ prisms of lift, or 8⅔ for the two locks, one at each end of the summit. If our views of the case be therefore correct, this uncommonly well made and carefully attended canal loses this last quantity daily from its summit by the leakage of its locks.

63. Messrs. Fisk and Hughes, in their report of March 1837, (p. 16, 17,) fix the leakage at each set of locks adjacent to the summit at 12 locks-full (prisms of lift) per day. This was the result of very careful observations upon the locks of the Chesapeake and Ohio canal, made by Mr. Fisk, its chief engineer. All the locks of this canal are about the same lift, and the same dimensions in other respects: *i. e.* 15 feet wide, with a lift of 8 feet. Now, as the workmanship of these locks is probably the best in our country, and as that of other canals ought to be as good, we may take them as evidence of the degree of perfection to which we are willing to go in such matters, or which we are able to afford. As we believe, also, that the gates are as carefully attended to on this canal as on any other in our country, its results are, on that account likewise, a good criterion. The observations, however, were made during a period of suspended navigation, when the gates were closed with great care, and kept so for several weeks, while repairs were being made. Mr. Fisk has assured me that, in his opinion, the actual leakage of the gates when in activity, exceeds the amount stated, great as it may be considered; we have, therefore, the assurance of the chief engineer of the canal, that it is less than that which really occurs to the canal when in use. 14

64. We have ourselves frequently observed the leakage at the locks of this canal, and we are satisfied that Mr. Fisk has not exaggerated the loss. Twelve locks-full per day, for each lock, is half a lock-full (prism of lift) per hour. Now, to bring this rate of leakage more within the judgment of the general reader, and to enable him to test it by what he may himself have observed on canals, we will make a comparison in a shape in which the quantity will be more readily comprehended than that of the rate of cubic feet per minute. Half a lock-full per hour is 62½ cubic feet per minute: the lock-chamber being 100 feet long by 15 wide, will give a superficies of 1,500 feet. Now, this rate of leakage would not raise the water in a lock of this size more than one foot in twenty-four minutes, or half an inch per minute.

65. This leakage is twice and a half as great as that of the locks on the Languedoc canal. We acknowledge it to be great, but, as the workmanship of the locks on the Chesapeake and Ohio canal is as good, and the vigilance of those who attend upon them as active as we have a right to expect for the canal in contemplation, we can see no other correct course than to adopt, in our reasoning upon the water for that canal, the leakage just given.

66. The locks in the two cases—the Languedoc and the Chesapeake and Ohio canals—are sufficiently similar in their dimensions to attribute much of the differerence of leakage to differences in the manner of building. One is the work of a government, the other of an incorporated company; one was built by the agents of a gorernment, the other by contractors; with one, no expense in materials or skill in execution was spared; in the other, too generally, the lowest bidder was taken, who must of course secure his own profit in the kind of work and quality of materials. In works of this character, no system is so pernicious, or in the end so costly, as that of giving work to the lowest bidder under the delusive expectation of saving. Good work cannot be done for less than a just valuation: and when bids for less are made, they can result only in the ruin of the contractor, if he be faithful, or to the prejudice of the work, if he be not. The former is avoided with extreme care; the latter more generally occurs; and its consequences are, enormous expenditures under the head of "repairs," to which our public works are so frequently subjected, always exceeding the supposed savings on the accepted bids. An intelligent and skilful contracter will not offer to do work for less than its proper value; the uninformed, the inexperienced, or the unfaithful, may; and from the system pursued, in the hands of these latter our public works are generally thrown. No boast is so replete with false reasoning, so delusive to society, as that frequently made, of having let work at prices much reduced from those of the engineer's estimate.

If the engineer be competent, his estimate is no more than a fair cost of the work; then, if that work be let for less, it can only be to the prejudice of the work.

67. Our works must also partake of the degree of skill and experience in our mechanics, which is well known to be rather below the standard required for similar structures in Europe.

68. On these accounts, therefore, as well as the necessity of economy in first cost, it may easily be conceded that our canal structures are not carried to that degree of perfection which is found in other countries. By the way, upon this matter of economy in first cost it may be well to say a word or two. It should not be understood as meaning numbers of dollars, in comparing mile with mile, or lock with lock; but in the quantum of labour

which the same amount of money will command in the two countries. In our country, the wages of mechanics and of laborers are so much higher than in Europe, that the same amount of service cannot be obtained for the same cost; and, of consequence, works of the same cost in money must be inferior, because of the less labor upon them. Unless this idea is maintained, we always deceive ourselves in making comparison with similar works in Europe. While, therefore, I readily admit that the work of the Chesapeake and Ohio canal is probably the best of that kind in our country, yet it may, however, be said that it is inferior to similar works in Europe.

69. We may, then, without violation of probability, place this difference in the leakage of the locks to differences in the quality of the structures; and we may, also, from the character of the work on the Chesapeake and Ohio canal, assume its lock-gate leakage as a fair basis for estimates in our country.

70. But to return to the subject. Twelve locks-full (prisms of lift) for the lock at each extremity of the summit, is 24 locks-full per day. Each lock being 100 feet long, 15 feet wide, with a lift of 5 feet, will give 7,500 cubic feet for its prism of lift, or lock-full of water. This will equal 180,000 cubic feet per day, or 6,666.6 cubic yards; which, for a month of thirty days, will be 199,999.8—say 200,000 cubic yards.

71. Accident may increase the leakage of a lock so much as to make the process of filling it tedious; and yet the injury may not be sufficiently great to justify the stopping of the navigation in order to make repairs.

72. The leakage arising from the defective shutting of a valve would increase the loss considerably beyond the amount we have assumed; yet, it would not, in our judgment, be fair to embrace such a case in a general estimate of leakage, while we are willing, however, to admit its probability in the course of a season with some one of the many locks that may be dependant upon the same source for their supply of water. But, at the same time, the probability of such accidents should not be disregarded by the engineer; and while he cannot fairly include them in his estimate of the quantity of water actually required, it becomes his duty to show a surplus in order to meet them, or to point out the deficiency and its consequences.

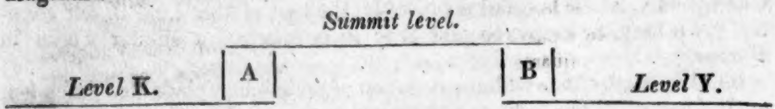
73. *Locks.*—Much has been written upon locks, the manner in which they should be arranged, and their lift, in reference to convenience and to the water they consume. The general result of the whole is, that the most favorable lift is from 7 to 8 feet; that they should be as far from each other as the nature of the ground will admit, and so far as not to impede the navigation by the abstraction, from an intermediate level, of a lock-full of water; avoiding, if possible, aggregate locks, or locks immediately adjacent to each other; and, that among a series of locks dependent upon the same source for supplies of water, the lift should never increase as they descend. It may decrease advantageously, but this is a nicety belonging to the engineer in arranging his plan. The illustration of all these positions would lead to remarks purely professional, inapplicable to the object of the report. and therefore uninteresting. We shall on these accounts avoid it, leaving what may be necessary, if any should be, to the particular case which the plan may develop.

74. The simple question upon which it may be proper to say something at present, is, on the supposition of well-arranged locks at proper distances from each other, what quantity of water will the passage of a boat require.

75. Engineers have given various opinions on this subject: one prism

of lift, one and a half, one and three-quarters, two—all depending upon the degree of presumed regularity in the trade. The matter is familiar to them. We hope they will not suppose it our object to instruct them on a subject upon which they are known to be so well informed. We desire only to make it equally plain to others.

76. To aid in the illustration, we will make use of the following diagram:—



An alternate passage means one wherein the two boats pass each other on the summit-level, or pass the locks alternately.

1st. When a boat in the level K arrives at the lock A, the lock has to be filled in order to raise the boat to the summit. The same process has to be gone through when a boat in the level Y arrives at the lock B, in order to raise this second boat to the summit also. These two boats on arriving alternately at the locks A and B find them already filled by the process we have just described, and immediately pass into them. Then, on descending to the adjacent levels, K and Y, each boat exhausts the lock-full (prism of lift) which had been used to raise the other. This is the case of two locks-full for an alternate passage, or one lock-full for each boat, and which is the least quantity can be exhausted per boat, under the most favorable circumstances.

77. One boat making the passage would consume no more. On arriving at a lock, the lock would be filled in order to raise the boat, and would remain filled after the boat had passed out into the upper level. Then, on descending at the opposite end, it would exhaust a prism of lift, or lock-full.

78. We have said that one prism of lift per boat is the least which can be exhausted under the most favorable circumstances; for, if the lock A or B were full on a boat presenting itself to be raised, the case becomes altered; then the lock must be emptied to admit the boat, before it can be raised; and after this, by which one lock-full is drawn off, another lock-full must be drawn off, to lower the boat at the opposite end of the summit. We see, therefore, that the case of one lock-full per boat is on the supposition of a regularity in the passages and attention to the locks that is hardly possible in practice; in fact, it may be considered as never occurring.

79. 2d. We will now suppose the case of two boats passing in succession. For the first the lock has to be filled; it then passes to the summit. But for the second, this lock-full has to be let off, that the boat may enter the lock; which has then to be filled again in order to raise the boat: the two boats, therefore, are raised to the summit by the exhausting of one lock-full of water. On arriving at the other end, one lock-full for each boat is exhausted, to enable the two boats to descend: in all three locks-full, or prisms of lift, for the passage of two boats in succession. This is a case of one lock-full and a half for each boat, and which also requires the most favorable circumstances; for, as in the first case, if the lock were filled when the first boat presented itself to be raised, it would have to be let off before the boat could enter; which adds another lock-full to the quantity exhausted by the successive passage of the two boats or two locks-full for each.

3d. Suppose three boats to present themselves at the same lock in succession. The first is to be raised by filling the lock; the second, by exhausting that used to raise the first, and filling again; the third, by exhausting that used to raise the second, and filling again. The three boats are therefore raised by exhausting from the summit two locks-full. But on arriving at the opposite end, one lock-full is necessary to let each boat down. The passage of three boats in succession will then require five locks-full, or six, if the lock be full on the approach of the first boat.

4th. If we suppose a passage of four boats in succession seven locks-full, or one and three-quarters to each boat, will be required; or two for each, if the lock be full on the approach of the first boat.

80. We have seen, therefore, that as small a quantity as one lock-full for the passage of a boat is scarcely a possible case; that a lock and a half for each boat is the least that can be used in the successive passing of two boats; that a lock and three-quarters is the least that can be used in the successive passing of four boats; and that, in every case, if the lock be full on the approach of a boat, two locksfull will be required for the passing of the summit by every boat.

81. To generalize the case for any number of successive passages, it is that the least quantity of water which can be used is twice as many locks-full, less one, as the number of boats, (or two locks-full for each boat,) when the first boat finds the lock full on its approach.

82. Our trade is not only periodical, but is at all times in fleets, from the nature of business and the social habits of boatmen. Who ever observed on our canals an alternate direction of every boat? They are generally—I may say universally—in groups or fleets; three, four, or five, in one direction; then three, four, or five in another. Passages may balance each other on the same day in different directions, but this does not constitute alternate passages. If five boats pass in one direction in one hour, and five in the opposite direction in the next hour, it does not constitute the alternate passages upon which the estimate of one lock-full of water for each boat is founded. These are successive passages for the whole number of boats, except one. An alternate passage is, when two boats pass in opposite directions, before either is succeeded by another boat; or, when any number of boats pass alternately, without any *one* to follow another until after a boat from the opposite direction has passed. When fleets from opposite directions meet at a lock, alternate passages are adopted by the rules of canal companies; but when they meet on a level, they pass each other in fleet, and the locks at each end in fleet. On meeting at a lock, equality of rights demands alternate passages; but on meeting on meeting on any level of the canal, equality of rights demands no such sacrifice of time; nor is it necessary, nor would the trade submit to it, nor has any attempt to exact it ever been made.

83. But the passage of fleets in different directions, or of a fleet and a boat, has its influence upon the quantity of water required. We will see what it is; (our reasoning, is applied to the passage of a summit;) but we will first, however, again explain why it is that one alternate passage, which is the passage of two boats in different directions, consumes less water than a consecutive passage, or the passage of two boats in the same direction.

84. In the first case, each boat is raised to the summit by merely filling the lock. The water has not yet been exhausted or drawn off, or let down below the summit; it has only been let into the lock. On passing to the opposite ends of the summit, the locks are found as they were left, filled with water: each boat, on descending, takes only the lock-full, which it

found ready, down with it. As these two boats, therefore, were raised without drawing off any water from the summit, and were let down with one lock-full each, the two consumed but two locks-full in the passage. This is the *alternate passage* of the engineer.

85. In any other order of passing, as has been before explained, and which must be successive, the two boats cannot consume less than three locks-full, or one and a half each. Now, as it can only be two single boats meeting each other which can make an alternate passage, it can therefore only be the two first boats of two fleets; the remaining boats of the fleet make consecutive passages. The case, therefore, of two fleets meeting on a level, or passing in opposite directions, resolves itself into that of a fleet meeting one boat; or, into one alternate passage and consecutive passages for the balance of the fleet. It matters not whether this alternate passage be with the first or any other boat of the fleet; the effect is the same.

86. 1st. The smallest fleet is that of two boats. If a fleet of two boats meets one boat, it constitutes one alternate passage and the consecutive passage of one boat. The quantity of water consumed is, therefore, three locks-full for the three boats, or one lock-full per boat.

2d. If a fleet of three boats meets one, it is one alternate passage and the consecutive passing of two. The four boats, therefore, consume five locks-full of water, or one lock-full and a quarter each.

3d. If a fleet of four boats meets one, it constitutes one alternate and three consecutive passages; or, the five boats will consume seven locks-full of water; which is one lock-full and two-fifths each.

4th. If a fleet of five boats meets one, it constitutes one alternate and four consecutive passages; or nine locks-full for the six boats; being one lock-full and a half each.

5th. If a fleet of six boats meets one, it constitutes one alternate and five consecutive passages, and will consume for the seven boats eleven locks-full of water; or one lock-full and four-sevenths to each boat.

6th. If a fleet of seven boats meets one, it constitutes one alternate and six consecutive passages; or the eight boats will consume thirteen locks-full of water, or one lock-full and five-eighths for each boat.

7th. If a fleet of eight boats meets one, or if (which gives the same result) eight boats pass in one direction while one passes in the opposite direction, the nine boats will require fifteen locks-full of water, or one and six-ninths, or one lock-full and two-thirds each.

8th. And a fleet of nine boats meeting one, or nine passing in one direction and one in another, the ten boats will require seventeen locks-full, or one lock full and seven-tenths for each.

87. We see by the foregoing, therefore, that more than one lock-full must always be used: that the second supposition requires one lock-full and one-quarter for each boat; the fourth one and one-half; and the eighth nearly one lock-full and three quarters.

88. Now, this is all the rigid result of theory, on the supposition of the most favorable circumstances, which can never be obtained in practice. Irregularities will creep in: they are unavoidable; and, as previously explained, these irregularities soon throw every case into that of a maximum exhaustion, or two locks-full of water for each boat. We are not theorizing, but endeavouring to exhibit practical effects; we must pay attention, therefore, to such practical results as are highly probable.

89. There is another, and not inconsiderable cause of waste, which is, with most propriety, to be placed to the account of lockage, as it is occasioned by the passing of boats: we mean that of the column forced over

waste-weirs, over lock-gates, and down the feeding-flumes, by the wave from the motion of the boat. In an active trade, this will be found to be a serious cause of waste: to which may be added that arising from the fact of the lower gates, after a boat has entered, always being somewhat open until forced to by the current created by letting water in at the upper gates, by which much water is lost.

90. It is somewhat singular that, while two locks-full per boat is the maximum of theoretical reasoning on this subject, it is yet, however, the result of common irregularities of trade and of slight inattention on the part of lock-keepers. Does any one doubt that these irregularities and inattentions are of common occurrence? If so, let him pass a few weeks on any of our canals, and his doubts will be removed. The maximum of theory, then, being no uncommon result in practice, would it be proper—would it be safe for an engineer to estimate a less rate for his lockage? We think not; and we therefore adopt it as the rate by which our judgment of water exhausted from this cause will be governed.

91. A distinguished writer on this subject has introduced, in his calculations, of the water consumed in the passing of locks, a deduction of the quantity displaced by the submersion of the boat. Although we cannot dispute the correctness of the consideration, yet, when a view so rigorous has to be taken in order to prove the sufficiency of water for a canal, it becomes, in our judgment, a worse than doubtful project.

92. There is also a serious loss of water arising from a cause hardly attributable to either of the heads named, and particularly to be noticed in wide canals: we mean that occasioned by high winds, which dash the waves over the towing-paths, down the feeding-flumes, and over the lock-gates.

93. Under all these considerations, therefore, we repeat the opinion that we adopt two locks-full of water for the passage of the summit by each boat; and we cannot, without a reproach from our own judgment, adopt less.

94. *Feeders*—It is a well-known fact, attested by universal experience, that the loss of water from feeders is greatly disproportionate to that from canals: we mean simple feeders, which are small canals to pass water, and too small for the usual canal-craft. Various causes are assigned for this peculiarity: the greater velocity, by which the water being more agitated, occasions increased evaporation; the smallness of the column, which, becoming sooner and more heated by the sun, produces, on this account, also a greater amount of evaporation; the less consolidation of the bottom and sides, from the diminished volume of water causing less pressure, from which filtrations are the greater; the purer and clearer condition of the water, carrying little or no sediment or dissolved earth, by which in canals the filtrating pores of the exposed surface become gradually closed. These, and others more philosophical and abstract, are given as accounting causes. Be they, however, correct or not, the fact is as stated, and it should be taken into consideration in reasoning upon feeders.

95. The best constructed and oldest feeders known are those of the Briare and Languedoc canals of France. Of these it has been remarked, that, with the exception of covering, no other precaution to prevent losses of water can well be imagined.

96. The noted feeder of the Briare canal is called "the feeder of Saint Prive." Its length is about 11 miles, and its average dimensions about 12 feet at water-surface, 9 feet at bottom, and 3 feet deep. After frequently-repeated and most exact gauging, it was found to lose three-fourths of the water it received; or, in other words, it delivered into the canal but one-

fourth of the water which it received from its source of supply. This loss is equivalent to about 0.68 per mile of the quantity received.

97. To the Languedoc canal there are two feeders: the Plaine and the Mountain feeder. The entire developement of these is 88,225 yards rather more than 50 miles. Of this developement 32,876 yards are artificially constructed; the balance being the old beds of streams, in which, whatever may be the filtration, it has long since arrived at its minimum. Of the 32,-876 yards, 20,254 yards are made through a comparatively impermeable granite: that is, about one-fourth of the whole length. Various concurring circumstances are stated by Huerne and others as well adapted to reduce the filtrations of those feeders Nor is the loss they experience alluded to as extraordinary; yet, from a critical comparison of the water received and delivered, the actual loss per year is more than 100 times the water-prism, (Huerne, p. 270,) or more than 10 prisms per month for a navigation of 10 months, Now, this loss must be chiefly on that part which is not made through the comparitively impermeable granite, and may, therefore, be charged upon 68,000 yards, about three-fourths of the whole distance, which would make about 125 of its water-prisms during the navigable year, or 12½ prisms per month.

98. The size of a feeder may be assumed at 12 feet water-surface, 8 feet at bottom, and 3 feet deep. This would give a cube or prism per mile of 158,400 cubic feet, or 5,866.5 cubic yards. Now, 12½ times this prism would be 73,332.5 cubic yards per month, or 45.8 cubic feet per minute.

99. *Reservoirs*—We shall view these under the limited aspect required by our object: their ability to retain water, and the quantity which it is probable they will receive in proportion to the rain upon a given surface. Upon this last peculiarity, climate has, without doubt, a great influence. In northern climates, the ground is longer and harder frozen; the accumulation of snow upon its surface proportionably greater, which passes into the reservoir from gradually melting by the warmth of spring, losing less by filtration, as less will pass through the frozen surface of the soil. On these accounts, there can be no doubt that more water will be collected in more northern climates, for, in more southern, a greater portion of that which falls on the surface of the soil will pass off by filtrations. These considerations would make more lakes in a northern climate, more and larger springs in a southern; which inference we believe to be actually sustained by the general physical peculiarities of the globe.

100. The point first to be established is, what proportion of down-fall-water upon a given surface can be collected in a reservoir? Upon this we have searched in vain among the works of European engineers for the result of direct observation. All is estimate, conjecture, speculation; the general result of which, however, is, that about one-third of the water which falls may be collected in a suitable reservoir. The form of the surface of the soil has not so much influence as many would suppose, except in the rapidity of the drainage. Numerous streams are found in a rolling country—extensive swamps in a flat; and the greater evaporation which water in the latter experiences from longer exposure, about compensates for the les filtration of the former from a more rapid flowing off. Of course, we have not in mind extreme cases of either.

101. Sutcliff, (p. 84,) speaking of the Rochdale canal, after a calculation on the subject, says: "which plainly proves that, notwithstanding the close texture of the soil, little more than one-third of the rain which falls upon them (the commons) can be got into the summit-level: and, were these commons cultivated, I do not think that more than one-sixth part of the rain that would fall upon them could be drained off."

102. When the Chenango canal, in the State of New York, was about being made, and which was to depend principally upon water collected in reservoirs for its supply, the engineer, Mr. J. B. Jervis, estimated one-fifth of the downfall-water as the quantity which could be collected; but, with a view of ascertaining the matter more accurately, he had experiments made in the valleys of two streams, Madison brook and Eaton brook, which will be found in the report of the New York canal cammissioners of January, 1836.

To be Continued.

Report of Hother Hage—Chambersburg and Pittsburgh Survey.

To the Board of Canal Commissioners, of Pennsylvania :

Gentlemen :—In obedience to your instructions, I have the honor to present the following preliminary reports on the exploration of a route for a rail-road from Chambersburg to Pittsburgh, and of slack water navigation from the Coal and Iron region of Bedford county, to the public works on the Juniata River, intending to submit further reports as soon as the necessary estimates, maps, and profiles shall be completed.

RAIL-ROAD FROM CHAMBERSBURG TO PITTSBURGH.

The instructions under which the present examination was conducted, required a route for a continued rail road, without inclined planes, on which stationary power would be necessary: or in the event of its impracticability, such a portion of a MacAdamized turnpike as would continue the transportation partly by this mode of communication. A wide scope of country, untrammeled by any intermediate fixed points, and only limited by the Pennsylvania improvements on the north, was granted for the exploration.

On examining the district embraced within these limits, the valley of the Potomac river by the way of one of the branches of Will's creek, near the source of Flaugherty creek, and thence by Castleman's, the Youghiogheny and Monongahela rivers to Pittsburgh, strikes the observer as a natural opening for a rout possessing certainly the advantage of opposing but a single summit between the eastern and western termination of the line. This route has already been found practicable by actual survey, and is believed to be the line adopted by the Baltimore and Ohio rail road company, but as a great portion of it would pass without the boundary of the State of Pennsylvania, it is doubted whether it could be considered as a line intended for examination.

The great length too of this route would render it objectionable, and the contemplated connexion of the Franklin rail road with the Baltimore and Ohio improvement, makes at all events an examination at present unecessary.

On the other hand, it was thought that an exploration in a direction nearly contiguous to the Pennsylvania improvements, though south of them, would be equally undesirable.

Here the great length also, the difficulty of approach to the Alleghany mountain in this quarter from the east, and the uncertainty of surmounting that barrier in the immediate vicinity of the Portage rail road, would render the exploration of the route inexpedient, excepting only in the case other lines should fail.

A route situated between these two was therefore considered most desirable, thereby aiming at the shortest practicable line, and leaving for future surveys the routes that may claim advantage in point of easy grades. With this view a thorough reconnoisance was made of this region, its topography was closely studied, and the intricate passes of the mountains explored.

The formation af the Alleghany range of mountains is generally so well known for regularity, that any one portion of it may in a great measure serve to convey an idea of the whole. Their character in counties traversed by this survey, has however peculiar features that favor the location of a rail road. By a reference to the map, a better idea of these may be obtained, than can readily be conveyed by description.

It will there be seen that the Cove mountain, Scrab Ridge, Sideling and Ray's, hills, Tussey's, Evitt's, Will's, Buffalo, and the Alleghany mountains, together with Laurel hill and Chesnut ridge, form the most prominent obstacles to be passed. The Raystown branch of the Juniata river flows however several miles in an easterly direction from the Alleghany mountain, opening a passage through or around Tussey's, Evitt's, Will's, and Buffalo mountains. Near a source of this stream, but west of the Alleghany mountain an elevation in the ground crosses the valley between the mountain and Laurel hill, so as in a manner to connect them causing the waters in Somerset county to flow to the north into Connemaugh and south into Castleman's river.

Farther west the Loyalhanna creek forms a convenient gap in Chesnut ridge, nearly in a direct course towards Pittsburgh. Again, if we turn to the east a depression will be found in the Cove mountain, where it joins the Tuscarora, and the waters of Aughwick creek flow through the only gap in Sideling hill that can be found for many miles.

In this manner the line, commencing at Chambersburgh, passes through Cumberland Valley, crossing the west Branch of Conocheague creek some distance below Loudon, thence ascending the side of Cove mountain it reaches Couan's gap, and descending the waters of Augwick creek by the Burnt Cabins, to Sideling hill run, it turns up that stream. Passing through Well's valley it meets Rays hill, or properly a point where the Harbour mountain joins the Broad Top Mountain, where a tunnel will be unavoidable.

By these means the waters of the Raystown Branch of Juniata are attained, when the route passes through Ground hog valley, and crosses the Juniata Branch near Piper's Run, where it ascends into Woodcock valley, whereby a near cut is effected to Bloody Run. At the village of this name the line again meets the ravine of the Juniata, and passing the town of Bedford continues to ascend along the river bank until Buffalo mountain is attained. Here an increased grade in the road will take the line on high ground.

Crossing from Buffalo mountain to Dry Ridge, a spur of the Alleghany mountain is reached, and by ascending along the slope leading to Deeter's run, it crosses that stream, meeting the main ridge of the Alleghany at a favorable place for the second tunnel

After penetrating through this mountain, the line takes a southerly turn towards Berlin, thence sweeping to the west, it passes about 3 miles north of the town of Somerset, and pursuing the dividing ground between the waters of Conemaugh and Castleman's river, it meets the base of Laurel Hill.

From this point a very circuitous route, winding among the ravines of the mountain, takes the line to Laughlinston, and descending along the

valley of Loyalhannah, it passes Ligonier; thence after passing through the Gap in Chesnut ridge, it leaves this creek near the mouth of fourteen mile run.

Having ascended the valley of this stream, the line was conducted by the sources of the Crab tree run to the waters of Sewickly creek, and thence near Greensburgh to the waters of Brush creek. By descending this stream and Turtle creek, it meets the Monongahela river, and by its bank finally reaches Pittsburgh, terminating at the outlet of the Pennsylvania canal into this river.

The following tabular arrangement will more fully illustrate these points, their distances apart, and levels above the place of commencement, at Chambersburgh.

	Intermediate distances.		*Total distance fm Chambersb'g.*		*Levels in ft. above Ch'bg.*
	miles	chs.	miles	chs.	
From Chambersburgh to Cowan's Gap,	29	36	29	37·69	609·00
Thence to Burnt Cabins,	6	34	35	70·69	242 80
do Mouth of Sideling Hill Run,	9	78	45	68·69	80·70
do Gap in Sideling Hill,	10	28	56	16·69	248·80
do Tunnel through Harbor Mountain,	9	9	65	26 05	888·70
do Raystown branch of Juniata,	6	78	72	24·05	268·50
do Bloody Run,	9	50	81	74·05	400 00
do Bedford,	8	10	90	4 53	446·40
do East end of Alleghany Tunnel,	32	47	122	51·77	1854.82
do Top of Alleghany Mountains,	0	20	122	71·77	2329 76
do Near Berlin,	7	36	130	27·77	1672·74
do Somerset (town being 1492,35 a)	12	24	142	51·77	1704·25
do East base of Laurel Hill,	10	59	153	30 79	1605·19
do Top of Laurel Hill,	8	78	162	28·79	2081.69
do Turnpike at Laughlinstown,	27	29	189	57 79	718 97
do Where line crosses Loyalhanna creek,	3	33	193	10.79	545 63
do Ligonier,	9	53	202	63.79	375 69
do Merkle's summit,	4	55	207	38·79	675 21
do Barnhart's summit,	1	72	209	30 79	562·95
do Barclay's,	4	79	214	19·79	619·10
do Mouth of Brush Creek,	12	59	227	8 79	150 92
do Mouth of Turtle Creek,	5	66	232	74 79	147 49
do Outlet Lock of Pa. Canal at Pittsburgh,	9	78	242	72·79	94·20

Whilst the operations incident to the survey of this line were carried forward, it became sometimes doubtful whether by deviating from the line at certain points, and again intersecting it at some distant station, a more eligible location might not be obtained.

The extent of the survey and a desire to prove the practicability of the route for an uninterrupted rail road communication, before the field operations should be closed, by the severity of the approaching season, prevented in several instances their examination. The most important of these would change the entire location a distance of about twenty miles

Two portions of the line offer opportunities of this character, and are too important to be neglected. The first would leave the present route about four miles west of Bedford, and ascend the valley of Deeter's run on the opposite side. Passing in the vicinity of Schellsburg, it would meet the main ridge of the Alleghany sooner, and attain a depression in this mountain, situated about a mile and a quarter to the north of the present tunnel.

This point was found to be 368 64 100 feet lower than the summit of the mountain over the tunnel, or 106·29 feet higher than the grade of it. Thus perhaps the necessity of a tunnel here might be avoided, and as this pass appears to be the lowest attainable, its examination is strongly recommended.

The other part of the line that may be much improved, by further examination, is situated on the Western slope of Laurel hill.

On the summit of this mountain a favorable depression was discovered, where the road may cross without even any considerable depth of cutting; but in descending the Western side, serious difficulties were encountered. These consisted not so much in the expense that would attend the construction of the work, as in the unfavorable curvature that was necessarily adopted, particularly in two instances, where the radius would not exceed four hundred and seventy feet, and in some others, where it was below one thousand feet, thereby also increasing the distance materially. The impenetrable nature of the woods, and the intricate position of the ravines, permitted the party that was engaged on this part of the line during three months, only to get an accurate knowledge of the topography of this part of the mountain, which resulted in the location made. More extensive surveys would by all means be advisible, before the construction of this part of the line is commenced, and the survey now made will materially facilitate their successful execution.

Among the deviations from the main line, which underwent examination by survey, one only is worthy of notice. This departs from it at the western base of Chesnut ridge and turns in a southerly direction, passing through Youngstown, and ascending along the Nine Mile run, it has a favorable summit near Pleasant Unity. Thence by the valley of Sewickly creek, the line is carried over good ground until it approaches near to Yougbiogheny river, where some short bends in the creek confined by abrupt hills, render a location more difficult.

After joining the River the line was taken along its bank past McKee's Port to the Monongahela river, and continued to the mouth of Turtle creek, where the other route is met.

The only advantage possessed by this line consists in its passing through one of the most fertile and highly cultivated parts of Westmoreland county, offering but few natural obstacles to a cheap construction. The line will however be materially increased in length, if this route is adopted; if the meanderings of Sewickly creek near its mouth are pursued, the length would be 20 miles and 73 chains greater than the Brush creek route; and if the line should be carried on the high ground across these bends of the creek, the distance would still exceed by 16½ miles the route first recommended. In the latter instance also, some expensive work and steep grades in the inclination of the road, would operate seriously against its adoption.

Other detours from the line first spoken of have been suggested, these have not been examined, but it is believed that they would all have a tendency to lengthen the line, however advantageous they may be in point of grades and cheapness of construction. It is of great importance to have some of these thoroughly surveyed, in order that accurate comparison may be formed among them; one in particular is important, as it would change almost the entire line west of Bedford.

It would leave the present line at the Buffalo mountain, and by the waters of Will's creek join the location of the Baltimore and Ohio rail road, thence by Flaugherty creek, Castleman's and Youghiogheny rivers, it would intersect the line run at the mouth of Sewickly creek.

Between the towns of Bedford and Chambersburg, it is believed that no material change in the route can be made.

The bold and unbroken character of the mountains in this quarter, offers no openings that would favor an attempt at reducing either the length or the cost of the road; should it therefore be deemed expedient to commence the construction of this important work, that division could be at once prepared for contract.

Taking finally into consideration the whole line as now established, independent of anticipated improvements by future surveys, it will perhaps appear, that its length of nearly two hundred and forty-three miles would hardly justify calling it the shortest practicable route for a road of the description required, when a communication between the eastern and western *cities* is the object.

In that case it would appear that the distance by rail roads from Philadelphia to Chambersburg, now in operation, being stated at 157 miles,

and the present line from Chambersburg to Pittsburg being 243 "

making 400 "

and by the state improvements the report of the Canal Commissioners of December, 1836, stated it at 395 ·43

which makes a difference in favor of the latter, of 4 ·57

It would seem therefore that a rail road extending in a parallel line along the present improvements, would be so much shorter. But if it is recollected that 439·100 of the Portage rail road are occupied by inclined planes overcoming an elevation in ascent and descent of 2,007,02 feet; it will be seen that a road uninterrupted by inclined planes, overcoming this elevation even at a grade of sixty feet inclination in a mile, necessarily would add (if localities would render it at all possible) about twenty-nine miles to its length, thereby making that road about twenty-four miles longer than the one here recommended.

The Canal Commissioners, in their report, make the following remarks upon this survey:

The act of the 14th April, 1838, authorized the Commissioners to have a survey made by competent engineers, of a route for a continous rail road from Chambersburg to Pittsburgh, without inclined planes, or for a McAdamized road and rail road in connexion. They were also required to have a survey made of the Raystown Branch of the Juniata, for canal, rail road or slackwater navigation, so as to connect the coal and iron region of Bedford county with the public works.

The Board appointed Hother Hage, Esq. to the discharge of this duty, with instructions to detail at least two corps of engineers for that purpose; and at the solicitation of citizens of Westmoreland county, authorized the formation of a third, with a view of having the surveys completed this season.

The survey has been so far completed as to enable the engineer to report, that a continuous rail road may be made without inclined planes from Chambersburg to Pittsburgh. The distance by the route surveyed is 243 miles.

* * * * * * * *

The distance of this route over the present turnpike is about 90 miles, winding as it does among the mountain passes. The tunnels will each be about 2,500 feet in length, the highest grade about 60 feet to the mile. A further report of the graduations of the road, with a profile and an estimate of the cost, will be furnished by the engineer, and laid before the legislature. No survey has been made of a McAdamized road and rail road in connexion.

The cost of a continuous rail road will be large, from the increased distance over the present turnpike. The cost of a McAdamized road would be so much less than the rail road, that it becomes an important

question which mode of improvement would be the most beneficial.—Economy in the construction, saving in distance, and the facility of keeping open the road in the winter months, are all in favor of a McAdamized road. Saving of time, avoiding all transhipment, economy in the price of transportation, are in favor of the rail road. The relative merit of the two plans can be best determined by accurate surveys and estimates.

The Board would recommend a more thorough examination of the route of a continuous rail road, and a survey and estimate of McAdamizing the present turnpike road, reducing the grades, wherever practicable, or the survey and estimate of a McAdamized road and rail road in connexion.

Extract from the Report of W. G. Williams, United States Engineer.

PRESQUE ISLE—ERIE.

This harbour, which lies in the State of Pennsylvania, and the only one of value owned by that State on the shore of the lake, is unquestionably the best in regard to natural advantages upon its southern shore. It is formed by a peninsula, which appears to be the result of some accidental accumulation of sand, and encloses a space of about three thousand acres, with an average depth of from ten to thirty feet; at present, however, owing to the unusual elevation of the lake, the low neck connecting it with the main land on the western side is covered with water, and the trees on that part have been destroyed by it, leaving the neck exposed to the violent action of the waters. The portion of land thus insulated is covered with trees, and with very little care may be rendered permanent against all encroachments of the lake. Government has already paid attention to this object, and furthermore, by modifying the circumstances of ground, projects an arrangement affording great facility to the ingress and departure of vessels.

The harbor thus enclosed is from four to five miles long, and about one mile in width, and vessels are now obliged to enter and return by the same channel, which to those proceeding to a continuation of route necessitates a detour of several miles, and often under unfavorable circumstances of wind creating great delay, if not, for the time being, an absolute interruption to the prosecution of their voyage.

The project referred to, is to open a channel at the west end of the harbor, by fortifying the neck in such a manner as to resist the action of the lake, leaving only a sufficient width for the ingress and departure of vessels. By this means the ebb and flow produced by the frequent and sudden changes of elevation in the lake, dependent upon winds, as already explained, would effect a channel of sufficient depth for all the purposes of commerce. A deepening of the channel at the eastern extremity of the harbour has been already produced in this way. Reference to the accompanying sketch of the harbor will show the advantages of this arrangement; it will likewise serve to illustrate further discussion of the subject in my report.

As a military depot, few places are more favorably situated than Erie; and it is in this point of view that Erie recommends itself to the protecting care of the United States Government with additional force.

By throwing up an extensive system of temporary works, the harbor would be quite inaccessible to an enemy from the side of the lake; whilst

the great channels of communication by the canal and rail-road to the interior, of which this point will become the common terminus, impart to it a degree of support sufficient to set at defiance every species of hostile incursion to which it could at any time be subject. From the report of P. S. V. Hamot, Esq., local agent at Erie, it would appear that, during the year 1837, about five hundred and forty-seven steamboats cleared at Erie, from the opening of navigation in the spring to the 30th of September following; and that tonnage amounted to about one hundred and eighty-one thousand seven hundred and ninety-one tons; and the number of passengers to seventy-nine thousand three hundred and forty-nine, and that the number of clearances of ships, schooners and sloops was one hundred and seven, whose tonnage amounted to seven thousand eight hundred and sixty-seven. Mr. Hamot has not been enabled to procure the official statement in regard to the last year, but estimates that the probable amount was nearly the same. The portion of breakwater extending from the western extremity of the island to the proposed channel is considerably advanced, and five hundred and seventy feet of it has been executed during the preceding summer; three hundred and sixty feet of this developement is by cribwork eight feet high; and two hundred and ten feet four feet high, filled with stones; a good deal of stone was also laid on the outside to give additional stability. This work will require to be continued eastwardly, to secure the head of the peninsula from the encroachments of the lake. Besides which, of the southern portion of this breakwater, extending towards the channel-piers, four hundred and sixty-five feet have been laid down, secured with stone, and partly completed; two hundred and twenty feet of the portion constructed last year has been raised one log higher, filled with stone, and completed, with one exception of bolting it down with iron. At the eastern end of the harbor, the portion of breakwater on the south side of the channel has been repaired, and it was found necessary to extend it by the cribwork to an extent of three hundred feet, laid down where the storms of last fall and winter had made a breach of upwards of two hundred feet in width, with a depth of water upon it varying from three to sixteen feet. These cribs have been filled with stone, and an embankment of stone has been thrown against either side, nearly to the level of the water, to give permanency to the work; repairs have also been made to the northern extension of the breakwater, as well as to the channel piers; also, in consequence of the high water at the commencement of operations, a dock was found necessary in front of the work-sheds and quarters, of three hundred and forty-two feet long, and three logs high, of about one foot each in diameter. The works have thus far answered the object intended, and an accumulation of sand has taken place at the western breakwater, tending to restore the firm condition of the peninsula, with the exception of the channel projected to remain open as a western entrance to the harbor.

The plan that remains to be effected in regard to Presque Isle harbor is to remove the work now above water, and in a state of decay, by sawing off the woodwork below the surface of the lowest water, and placing upon the old cribs a solid superstructure of stone. This is necessary to secure the work already executed, and is eventually the most economical method that can be adopted; for the woodwork above water, by the constant and varied action of the elements in this exposed situation, is subject to immediate decay, and the repairs constitute a never-ending source of expense.

[The following bill has been reported, and is now under consideration in the Legislature of this State.]

An Act to provide for the Construction of the New-York and Erie Railroad, by the State.

The People of the State of New-York, represented in Senate and Assembly, do enact as follows:

Section 1. It shall be lawful for the New-York and Erie Railroad Company, on or before the first day of July next, to surrender, grant and convey to the people of this state, all the rights, liberties and privileges of the said company, including all the property, real and personal, of the said company, and all the rights and interest which the said comdany may have acquired by contract or otherwise, of, in or to, any lands or other property; and the necessary conveyances, after having been approved by the attorney-general, shall be recorded in the office of the secretary of state; and thereupon, all the rights, liberties, privileges, property and effects of the said company of every kind and description, shall be vested in the people of this state.

§ 2. The said company, at the time of delivering the said conveyances, shall deliver to the comptroller, to be deposited in his office, all the deeds, contracts and conveyances made to or with the said company, or in which they have any interest, and all the maps, surveys, estimates, books of minutes, and other papers of the said company, together with a full and accurate account of all their acts, proceedings and expenditures, which shall be verified to the satisfaction of the comptroller.

§ 3. On complying with the preceding sections, it shall be the duty of the commissioners of the canal fund, as soon thereafter as the money can be procured by the issue of stock in the manner hereinafter mentioned, to pay to the said company all such moneys as they have expended on account of the said work.

§ 4. When the purchase of the rights and property of the said company shall be completed in manner aforesaid, the New-York and Erie rail-road, from some point or place on the Hudson river in the county of Rockland, to some point or place on Lake Erie, in the county of Chautauque, shall be a public work, and be constructed by the people of the state, and for their benefit.

§ 5. For the purpose of paying the said company as aforesaid, and the expense of constructing the said road, the commissioners of the canal fund shall borrow on the credit of the state three millions of dollars, at an interest not exceding five per cent. and the commissioners shall contract for the whole loan at one time, or at different times, as they shall deem most advantageous to the public interest

§ 6. All loans made for the purposes aforesaid, shall be payable at such time or times as the commissioners shall prescribe; and for such loans, certificates of stock shall be issued in the manner now authorized by law in relation to other public works; and so much of the public revenues derived from auction and salt duties, as may be necessary to pay the interest on the stock authorized to be issued by this act, is hereby appropriated and pledged to that object.

§ 7. There shall be two additional commissioners, and
and
are hereby appointed such commissioners, but they shall hold their offices by the same tenure, and may be removed in the same manner, as other

canal commissioners, and in case of vacancy or removal the place may be supplied in the manner now authorized by law.

§ 8. It shall be the duty of the canal commissioners to proceed with all reasonable diligence, to cause full and accurate surveys, maps, plans and estimates, to be made of the whole line of the said rail-road from the Hudson river to lake Erie, and lay the same before the legislature as soon as shall be practicable, together with the plan on which they propose to construct the said road, and the probable cost thereof; but it shall not be necessary to re-survey any part of said road which has already been surveyed with sufficient accuracy to enable the said commissioners to make the necessary maps, plans, and estimates. And the said canal commissioners shall proceed the present season, with the grading of such parts of the said road as they shall deem proper, and for the interest of the state; and they shall grade and prepare the said road for a double track, and lay down and complete a single track, with all necessary turns-out, and make all necessary erections and works connected with the said rail-road; and for all purposes of laying out and constructing the New York and Erie rail road, the canal commissioners shall have and possess all such powers as have been conferred on them by law for the construction of the canals of this state; and the canal commissioners hereby appointed shall be the acting commissioners on the said rail-road.

§ 9. The canal commissioners, on behalf of the state, shall assume all contracts made by the said company at the time of the passage of this act, and which shall be in force at the time of the surrender of the charter of said company to the state as aforesaid, and shall carry the same into effect in all cases where no change in the location or manner of constructing the said road shall be deemed necessary.

Recent Experiments at Paris on Raising and Heating Water by Savery's Atmospheric Engine. By M. M. Colladen *and* Championniere.

The note which I present to the Academy of Sciences (says M. Colladen) is a summary of the experiments I made with M. Championniere, civil engineer, with the steam engine on *Savery's construction.*

In these very simple machines, the steam raises the water by its immediate action. The steam is introduced into a vessel, then condensed, and produces a respiration or flowing in of water.

A second admission of the steam drives the water up into the reservoir.

These machines were the first steam movers employed in large works. They were afterwards abandoned for the machines of Newcomen and Watt.

Several manufacturers, especially Manoury D'Hectol, nevertheless have employed them.

As our experiments may serve to fix the value of these engines, and the conditions under which the employment of them may be preferable, we think it may be useful to publish them.

We possess very few estimates of the power of the Savery Machine:—Bradley, Smeaton, Menoury and Girard, have published some memoirs on its effects; but we find in no publication on the subject, the measure of increase of heat in the water elevated, nor of any other element needful to the theory of these motive powers.

But a very small number of the Savery machines are in existence. We

know of but five in operation, three are in the department of the Seine, the fourth in Loire Inferieure, and a fifth at Lyon. We believe there are none remaining in England.

We have experimented with the three of the department of the Seine. The oldest is at the *abattoir de Grenelle*, and was constructed by Manoury. The two others are in the Vigier baths; they were made by Gingembre.

The following numbers were obtained from these three machines in three series of experiments:—

Experiment of the 26th of March, 1833, on the bath machine of Pont Marie.

Temperature of the water of the Seine, 6¼°
Mean tension of the steam, 3 atm.
Water raised per hour, 12·213 m.
Height of elevation, 6·6 m.
Temperature of the water raised, 10¼°
Dry wood burned during one hour, 30·4 k.
Duration of a period, 26·0″

Experiment of the 10th of July, 1833, with the same machine.

Temperature of the water of the Seine, 19¾°
Mean tension of the vapor, 3 atm.
Water raised per hour, 12·724 m.
Height of elevation, 6·10 m.
Temperature of the water raised, 23½°
Dry wood burned in an hour, 46 kil.
Duration of a period, 26″

Experiment with the machine of Manoury D'Hectol.

Temperature of the water of the well, 12½°.
Mean tension of the steam, 00
Water raised per hour, 15·400 m.
Height of elevation, 14 m.
Temperature of water raised, 16½°
Charcoal burned in an hour, 13 kil.
Duration of a period, 90″

Agreeably to the first and second tables, the machine of Pont Marie gives 2·595 dynam to a kilogramme of wood.

This is about eight times less than the effective force of a small piston machine of the same force which would work pumps. But the water raised would have to be afterwards heated, so that we must take into account the increase of temperature, which was four degrees Cent. (=7⅕ F.) in the first series in the month of March, and three quarters in the second in July. Thus, in the first case, each kilogramme of wood sent up to the reservoir, by the action of the machine 1702 portions of heat (caloric), and the second 1255. With a more complicated machine than that of Savery, an additional heating apparatus would have been necessary, and this addition would have required the same expense.

Thus, whenever water is to be both raised and heated (and this frequently occurs in manufactories) the almost forgotten machine of Savery is the most advantageous motive power. It is the least costly at first, the least subject to accidents, and to wear and tear, and the most easily managed.

We will add a few words on the comparative effect of the three ma-

chines. In all of them the accession of heat was about four degrees, although the Manoury machine differs essentially from the two others.

The last machine performs more than double the work of those of Gingembre, at the same cost. Agreeably to the public report of M. Girard, in the 21st Vol. of *Annales de Physique et de Chimie*, the Manoury machine gave 20,202 dynam for each kilogramme of charcoal. This result surpasses that obtained by us, whence the increase of temperature of the water must at that time have been at a maximum of 2·8° instead of 4°. This measure is wanting in the memoir referred to.

From the foregoing experiments it results:

1. That the Savery Machine is a very valuable motive power which may be advantageously employed in many of the arts.

2. That the use of it ought to be limited to those cases in which water is to be heated as well as elevated.

3. That the machine of Manoury is the best model for imitation.—*Ann. des Pontes et Chaussees, trans. in Frank. Jour.*

Experiments with Captain Ericsson's Canal-boat Propeller.

We are glad to find that the success which attended the first experiment with Ericsson's Propeller, (noticed in our 721st, 751st, and 781st numbers) has induced some American canal proprietors to build a steam tow-boat, fitted with it, for the purpose of putting it to a complete practical test. The boat is called the *R. F. Stockton*, and has lately arrived in the Thames from Liverpool, where she was built last summer by Messrs. Laird, under the superintendence of Mr. Ogden, the American consul for that port. Several experiments have been made, the results of which appear very satisfactory, both in relation to the application of the propeller to inland and to ocean navigation; and these experiments derived additional weight from the fact of their having been performed and approved of in Liverpool, the grand emporium of shipping and of commerce.

Respecting the speed which it has been asserted may be attained by the new propeller, we have to notice a trial made below Blackwall on the 12th inst., in the presence of about thirty gentlemen, many of whom were scientific and practical men. The result was, that a distance of nine miles (over the land) was passed in thirty-five minutes, with the tide: thus proving the speed through the water to be between eleven and twelve miles per hour. The propeller was only 6 feet 4 inches in diameter; the dimensions of the boat are given in the account of the next experiment.

An experiment proving the great power of this propeller, with an account of which we have been supplied, was made on the 16th instant, between Southwark and Waterloo bridges, the result of which was as follows:—Four coal barges, with upright sides and square ends—

Nep, 15 feet beam, drawing 4 ft. 6 in. water.
Joseph, 15 ft. 7 in. beam, drawing 4 ft. 6 in. water.
Mary, 15 ft. 2 in. beam, drawing 4 ft. 6 in. water.
Ugie, 13 ft. 4 in. beam, drawing 4 ft. water,

were made fast to the steamer, which is 70 feet long, 10 feet beam, and draws 6 feet 9 inches water. Steam being set on, full speed was attained in about one minute, and the whole distance between the bridges, precisely one mile, was performed in eleven minutes, the time chosen for the

experiment being high water. The number of strokes made by the engines was 49 per minute—the cylinders 16 inches in diameter with 18 in. stroke. The difference in the speed of the propellers being as 9 to 10, and the outside one, revolving at the greater speed, and being attached to the crankshaft directly, it follows that the inside propeller made only 44·1 revolutions per minute. Now, although the circumference of the propeller is nearly 20 feet, the spiral planes are placed at such an angle that, *were resistance of the water perfect*, the boat could only proceed 14·04 feet for each revolution; hence the distance passed over in one minute could only be $44,1 \times 24,04 = 619$ feet per minute with such *perfect* resistance. The distance actually passed being $\frac{5380}{11} = 480$ feet, it follows that a distance of 139 feet was lost out of 619, which amounts to only 22½ per cent. loss of speed. Considering the *square* form of the barges towed, and that they presented together 59 feet 1 inch beam, with an average draught of 4 feet 4 inches, besides the sectional area of the steamer which is 43 square feet, and, considering that the propeller is only 6 feet 4 inches diameter, occupying less than 2 ft. 6 in. in length behind the stern of the boat; the result we have now recorded may, in a mechanical point of view, be considered of great importance.

The *R. F. Stockton* is an iron steamboat, and has been constructed as a tug-boat for the Delaware and Raritan canal in the United States, whereto she will shortly proceed.—*Lond. Mech. Mag.*

On Foundations upon Sand, and on Coatings of Mineral Tar: by M. Olivier, *Engineer.*

1. *Foundations on sand.*—At the school *des Pontes et Chaussées*, in 1830, it had been pointed out, that foundations on sand might be laid, wherever the earth was compressible, and in no danger of being carried away by floods. The canal of St. Martin was given as an example. I have several times applied the system thus indicated, and always with success. The following are examples: M. Dupuis, one of the conductors in my district, an architect of the town of Pont-Auderner, was employed to erect a building for the mayoralty. Its situation required that the edifice should be founded on the natural soil. This was well, for there is, in the valley of the Rille, a little below the soil, a bed of solid stones, mixed with sand, of about 31½ inches thick. M. Dupuis, feared that the ground under the bed of gravel was not good, and he had it sounded. It proved to be compressible, and when the gravel was removed, it became impossible to lay a good foundation on the earth which it covered. The architect deemed it needful, in consequence, to resort to piles, and these, it was ascertained, must be very long to reach solid ground. I went to see the work as they were beginning to drive the piles: it was a very expensive undertaking, which I proposed they should avoid, by substituting a bed of water sand, well watered with cream of lime. M. Dupuis, being responsible for the work, could not decide upon taking this advice, and continued the piles sufficiently for the whole front wall; but he adopted for the other walls the plan I had recommended. These were all, of course, united, though resting on different foundations, but they have all remained firm without any movement, or at least it has been uniform.

This furnishes a new proof of the safety of foundations on sand; 1st, since all the erections in the valley of the Rille, founded on the bed of gravel before mentioned, stand very well, though the ground underneath is compressible; 2d, since the walls placed on the sand, resting on soft ground have not sunk more than those built on piles, driven with the greatest care to a solid foundation.

Another fact. M. Fauquet Lemaitre, is a proprietor at Bolbec of several cotton factories. One of them being burnt down, he extended the other, which made it necessary to connect the new with the old walls; these walls, situated at the foot of a hill, were partly on a mass of chalk and partly on a bottom of green sand, in spaces where no chalk existed. This sand was moistened by infiltrations of water, which could not however wash it away. When a weight was placed on this sand and left at rest, the mass remained firm; but if a little motion were given to it, it became pasty and almost liquid. The builder thought he must have recourse to piles, and several foundations were prepared for their being driven, when M. Fauquet spoke to me about his buildings, and of the position in which he found himself. At this time, the experiment before cited had been made, and I advised him to lay his foundations on sand. I requested him to converse with M. Frisard, chief engineer at the Port of Havre, and he did so. The latter coincided with me, and added that all the masonry of the steam-engine of 60 horse power, was founded on sand and nothing had moved it. It was not so with the structures on piles; a side wall, connected with the foundation of the engine, placed on piles driven as deep as possible, had moved so much that the connecting stones were broken, so that they had to saw them off from the engine walls, the level of which had not changed. This accident, it was believed, occurred from the water contained in the sand, having collected more abundantly around the piles; and the friction of the latter against the ground, being diminished, they sunk until the masonry rested on the sand.

As other walls erected on sand or on rocks, have not moved, this experiment proves that foundations on sand are as safe as those on rocks, while we cannot rely upon the stability of an edifice constructed on piles and driven into sand; the friction which they encounter induces the belief that they have gone as far as possible, or necessary, and when any cause diminishing this resistance from friction occurs, an accident follows which proves the contrary.

The first experiment was made under my own eyes; the second I did not witness, but have every reason to believe that a true account was given me.

2. *Employment of mineral tar in structures of masonry.*—It has for a long time appeared to me that mineral tar, which does so well upon wood and iron, might also be used for covering stone and brick work, as a defence against moisture. Four experiments were made which confirmed this apprehension. But it will be well to premise that as mineral tar is obtained by distilling vegetable materials, it would be more suitable to call it pyroligneous tar.

Without touching upon all the cases in which pyroligneous tar may be employed, which we believe to be very numerous, we shall simply cite a few in which we have tried it.

The light house of Quillebuef had become much degraded by north-east storms. The rains were very copious, and the water passing into the brick tower, caused the bottom of the staircase to rot. We repaired the masonry, and in the month of May, 1833, painted the tower with

pyroligneous tar, which so far has perfectly answered our expectations; except that a few of the pilots pretend that the light-house being now black, is not so well seen as when it was white.

M. de Cachelu painted with the tar an earthen wall, exposed to the rains so much as to become very wet inside of the building. When I saw these walls, the tar had served as a complete defence against dampness.

Walls much exposed to storms of rain, are commonly defended by a coating of slate or cement, but the above experiments show that these two modes of defence may be advantageously replaced by a coating of pyroligneous tar.

The joints of the wall being well filled up and smooth, the tar is spread over it, and it penetrates the wall. When dry, a second coat is applied and immediately powdered over with sand. This, when solidified, is covered with lime white-wash, as thick as can be put on with the brush. This acting on the carbonic acid of the atmosphere, forms a crust of limestone which exists for a long time, and once in two or three years the wall may be re-white-washed.

We have employed this treatment on bridges very successfully.

In courts, and yards, and terraces, the tar-coating is now employed with great advantage. When worn or broken it is easily repaired.—*Translated from Annales des Ponts et Chaussees.*

[The following letter appears to contain an intelligent description of Railroad affairs in France.]

European Correspondence of N. Y. American.

PARIS, Nov. 21, 1838.

We have at Paris two papers for the Steamboat and Railroad communications exclusively,—*Le Chemen de Fer*, and *La Vapeur, Journal des Pequabots and des Wagons.* The occurrences and questions relating to them are, besides, introduced into a number of other journals, 'consecrated' to all questions of mechanical industry and *material interests.* Let me give you the titles of the principal:—Le Moniteur Industriel; L'Europe Industrielle; La France Industrielle; Le Phare Industriel; Le Capitaliste; La Bourse; L'Office de Publicite; L'Actionnaire; L'Egide; La Boussole; Le Negociateur.

The French are not inattentive to the British projects of steamboat lines to India and to South America, which, doubtless, will be, ere long, accomplished. American politicians and merchants should not overlook the prospectus of the London "Pacific Steam Navigation Company," (that is, Mr. Wheelwright's pamphlet,) wherein it is calculated, that "the presence of a number of large English steamers on the coast of South America will be certain to add to the influence (political) of England;"—that "the establishment of a regular line of steamboats between Valparaiso and Panama, calling in at all the intervening ports of any importance, will be of material benefit," and that, on the realization of the plan, "Jamaica will once more become an entrepot of supplies for the northern ports of the Pacific, and will be enabled, to a great extent, to resume that lucrative trade, by which her prosperity was formerly so much promoted." In perusing the reports of the proceedings at Newcastle, of the British Association for the Advancement of Science, I was struck with the following instance of the occasional fallibility of the luminaries and oracles of

science. ("August 26,) Dr. Lardner spoke at considerable length on the subject of steam navigation. He acknowledged that he had been in error in expressing his opinion with respect to the practicability of navigating the Atlantic by steam vessels, but expressed his opinion that they could not be profitably carried on." The case of the Great Western seems to prove that the great Cyclopædist was, a second time, in error.

Not only the journals styled *industriels*, of which I have mentioned the titles, but all the political and literary, discuss or notice the present situation of the Railroad enterprises. It continues, with small variations at the Exchange from day to day, such as I indicated in my last communication. The Companies and Stockholders are in the utmost perplexity and dismay. Numberless writers propose many different remedies or expedients. Some do not hesitate to advise paying off and entire abandonment in the case of the great lines, as to which nothing more has been done than surveys and estimates, and the choice of routes. Last winter the railroad fever or mania was at its height. The success of the work between Paris and St. Germain—the first, and quite peculiar—contributed largely to turn the heads of the small capitalists, and promote the designs of the very rich. Several of the principal prints were highly bribed to feed the fever; on the other hand, sagacious and earnest warnings were issued, and several pamphleteers ran to the opposite extreme, denouncing railroads as the nation's folly and scourge, the malediction of Heaven, &c.

In fact, the whole scheme of Internal Improvement, which party snatched from the Ministers, and committed to companies much less responsible, degenerated into mere *agiotage*, stock-jobbing—a game wholly abstract from all ulterior public action and good. There are upwards of eight hundred joint stock undertakings in Paris, all *speculative*, so that you may imagine what a profligate and desperate competition has resulted, to the enrichment of a multitude of the *knowing ones*, including great bankers, and the impoverishment of a host of small and honest dupes. The *Journal du Peuple*, of the 18th instant, presents an editorial article on the subject of a more candid tenor, than I would have expected from so violent an oracle of radicalism. In enumerating the causes of the general explosion, it admits, "the narrow calculations of a teasing, harrassing Opposition, which sacrificed what it knew to be the interest of the nation, to the desire of overthowing a Ministry." "*Les droits calcules d'une opposition triacassiere qui a sacrifi ce qu'elle savait etre l'interest de la nation au desir de renverser un Ministere.*

In the same article, the ensuing facts are stated. "A great number of Associations which promised the finest dividends, and possessed millions in the beginning, are now either setting up or dragging on, by means of loans, a precarious existence, and the stockholders are summoned to meet; only to vote the sacrifice of the capitals which were to bring them so glorious an interest. A mortal discredit has befallen all joint stocks and sleeping or limited partnerships. It is impossible to say when the public can be reclaimed from its present absolute distrust and aversion, to a reasonable confidence, touching any public enterprise. The railroad speculations attracted to themselves the capital which nourished the regular branches of industry. Three or four hundred millions of francs were called for at once,—a larger sum than was disposable. The discovery of the insufficiency of means; new and sounder views of the probable gains; and the sudden depreciation of the stocks, all happened simultaneously. The holders of stock groan and complain; the really useful labours of business suffer severely; the railroad companies have little

hope of realizing their funds; we hear of settlements, compromises, mergings; and it seems doubtful whether the large bankers, who are so deeply involved in the lines of Havre and Orleans, will be able to resist much longer the downward torrent. France will be brought back to the condition of merely envying the great lines of internal communication which constitute the prosperity of her neighbours."

Not a few of the public writers have declared unequivocally, that the spirit of association for general benefit, as contradistinguished from the spirit of speculation or *gambling* for individual and speedy profit, does not exist in France. The French, they say, know not what it is to club their moneys, primarily, for an object of general advantage; and in their directly selfish, individual speculations, they lack patience to await slow or distant returns. When any thing is to be done for the weal of a district, or city, or any interest beyond the immediate adventure, they look to the public authorities. In the railroad undertakings, as soon as the opulent bankers, who made a mighty flourish in subscribing millions of francs, quietly and almost furtively sold out, in order to realise a little profit in time, and thus occasioned an overflow of stocks into the market, all the small holders who had so eagerly petitioned and battled for shares, became quite as anxious and active to get rid of them. All rushed together, and the bubbles burst on every side. Capital turned in a vortex, as it were, but has finally stagnated. There is no real circulation—nothing is fertilized—no scheme of improvement can be safely pursued. I repeat compendiously what is published, and appears to me exact for the most part.

[To be continued.]

Important Invention.—At length woollen cloth has been produced from the stocking frame, which has all the appearance of loom wove cloth; but its texture and form of the threads cannot be discovered by the most powerful microscope. The process of milling has caused it to shrink into a mass of coagulated wool, resembling the felt of a hat, but its elasticity was not destroyed. Many able mechanics speak highly of the invention, which is excellent for trowsers, but too thick for coats. It is 8*s* 6*d* per yard, 10 per cent. cheaper than loom wove cloth of the same quality.—*Nottinghom Review.*

Great Improvement in Gun Locks.—An Italian named Kosaglio, who resides in England, announces a gun-lock, constructed upon such new and curious principles that it acts without any exterior combustion, needs no priming, and frees the discharge from all flame or smoke but what is emitted at the mouth of the barrel.

☞ We have not yet received an official account of the proceedings of the convention of Engineers. We have received an intimation of their nature, but abstain from giving it, as official minutes are now in preparation.

☞ The friends of Internal Improvement will rejoice in the appointment of Samuel B. Ruggles, of this city, as Canal Commissioner in the place of the late Stephen Van Rennsellaer.